SPIRE Detector Timeline Explorer (DTE) User Manual

Version 0.1

Gabriele Mainetti

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1. Detector Timeline Explorer (DTE)

The Detector Timeline Explorer (DTE) is a Graphical User Interface allowing a user-friendly view of SPIRE (both photometer and spectrometer) Timeline-type Products.

1.1. Starting DTE

DTE is an application that can be called from the Herschel Interactive Processing Environment (HIPE). At least one instance of Timeline-type products must already be available in memory to launch DTE (e.g. output from pipeline script or product loaded from local store).

In Hipe: identify the product for visualization from Variables list and right-click the timeline-type product, follow the "Open With" menu entry and select Detector Timeline Viewer from the drop-down menu (Figure 1).

DTE can also be called from the command line:

```
from herschel.spire.ia.gui import DetectorTimelineExplorer
dte=DetectorTimelineExplorer()
p=dte.createFrame(yourProduct)
```

The DTE run also within DatasetInspector.

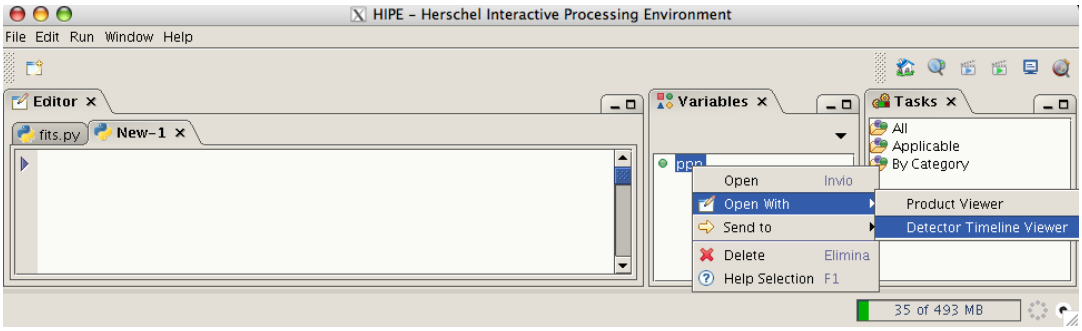

Figure 1. Starting DTE via HIPE.

1.2. DTE Layout

The Display Panel is divided in three section (see Figure 2) :

LEFT - Array Display	In this area we have a region to display the arrays of bolometers (three arrays for photometer, two for spectrometer).
RIGHT - Quick View	This area is used to display the plot.

BOTTOM - Control Panel This section contains menu to select the array and the type of sub-products that you want view. In this area we have also the slider and play-stop button for browsing trough time across the timeline and we can select color scheme, time scale, etc.

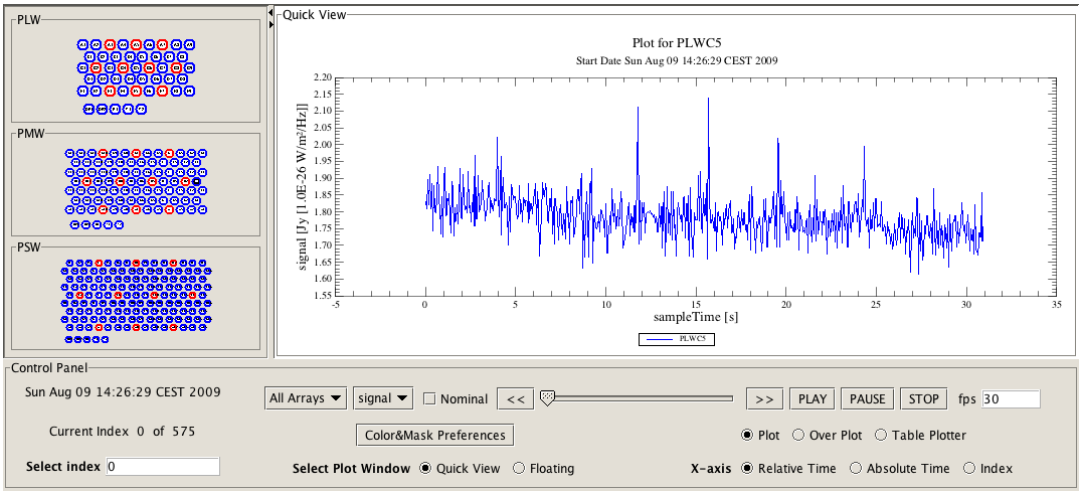

Figure 2. DTE Layout.

1.2.1. Array Display

Array Display area show the bolometer's arrays (Figure 3); Control Panel contains drop-down menu to select if visualize all the arrays or only one (Figure 6).

The color scheme for bolometer's arrays are two (heat and grey) and we can select which we use into "Color&Mask Preferences" Panel (Section 1.2.6). The value for both color scheme are based upon intensity at current index of the channel.

Coalligned detectors have a red border.

We can visualize only the nominal bolometers selecting the "Nominal" checkbox in the Control Panel (Section 1.2.3).

We can plot a timeline with a single click on desired detector and when the mouse is over a bolometer we can view the instantaneous value within tooltip.

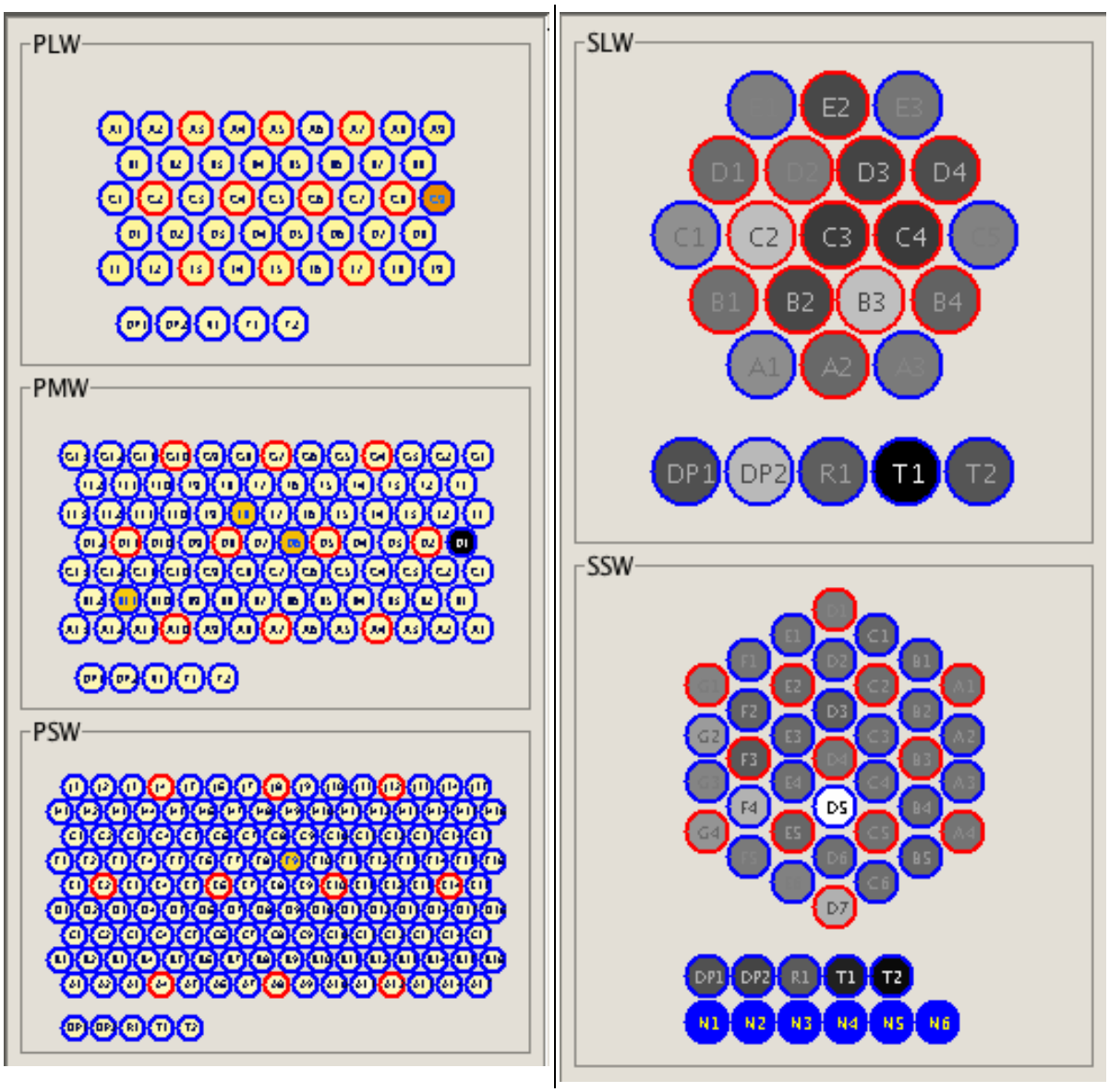

Figure 3. Array Display: on the left the visualization for the photometer using the "heat" color scheme, on the right for the spectrometer using the "gray" color scheme.

1.2.2. Quick View Area

"Quick View" area is used to visualize the plot (Figure 4).

When DTE start, a plot is created within "Quick View" area. An array's central detector is plotted, otherwise, if no one central detector is good, is plotted the first valid detector.

We can visualize the plot in Quick View area or in a new floating windows (explanation to how select the plot windows in Section 1.2.3). When we select floating windows to display the plot, each plot creates a new window (Figure 4) and erases the "Quick View" area.

We can also create over-plot (see Section 1.2.4).

We can visualize the data with Table Plotter (see Section 1.2.5).

We can also get access at all plot properties (axis scale, title, label, etc.) with a simple right-click over the plot.

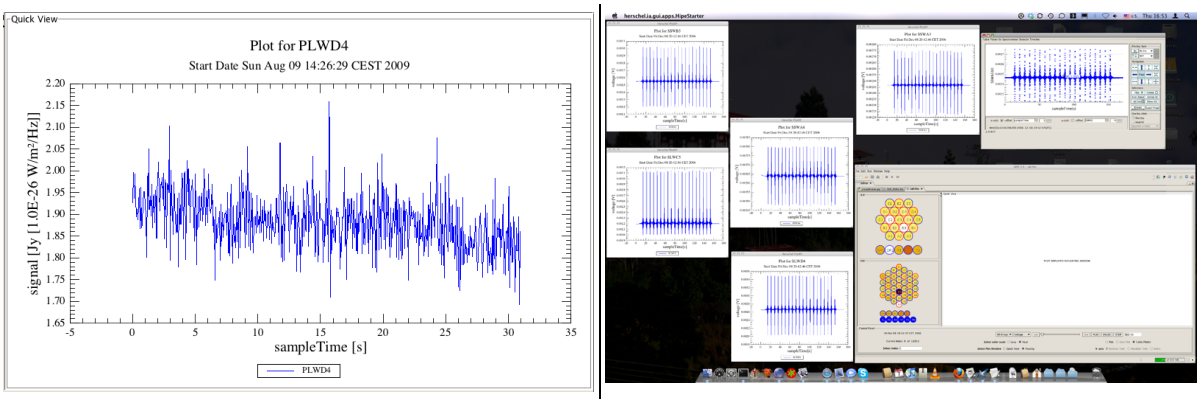

Figure 4. Plot visualized in the "Quick View Area" (left) and in the floating windows (right).

1.2.3. Control Panel

Control Panel contains (Figure 5):

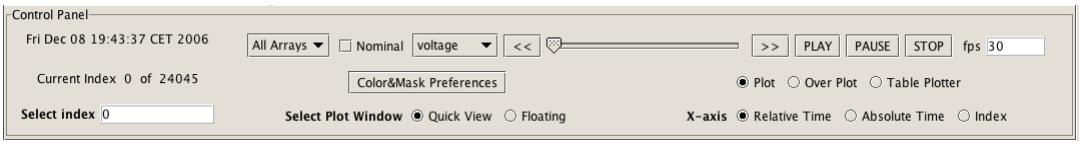

Figure 5. Control Panel.

- Data of the observation;
- "Current Index" label that shows row/readout #;
- "Select Index" writable field allowing to choose the row/readout #. A warning message appears if selected index is out of range;
- Drop-down menu to select the array and the dataset (Figure 6) that we want view;

Figure 6. Drop-down menu to select the array (on the left) and the dataset (on the right).

- "Nominal" checkbox: we can select it to visualize only the nominal bolometers;
- "Color&Mask preferences" button to open the preferences panel for color and mask (Section 1.2.6);
- "Select Plot Window" radiobuttons to select where create a plot (in Quick View area or in a new floating windows). When "Over Plot" checkbox is selected, the plot is always create into Quick-View area and "Floating" button is disabled;
- A slider and play/stop buttom for browsing trough time across the timeline (Figure 7). We can also choise the frame per second (fps);

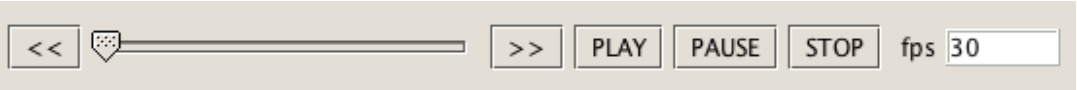

Figure 7. Slider for browsing trough time across the timeline.

- Three radiobuttons ("Plot", "Over Plot" and "Table Plotter") that allow creation of plot, overplot (see Figure 8 and Section 1.2.4) or data visualization with Table Plotter (see Figure 8 and Section 1.2.5);

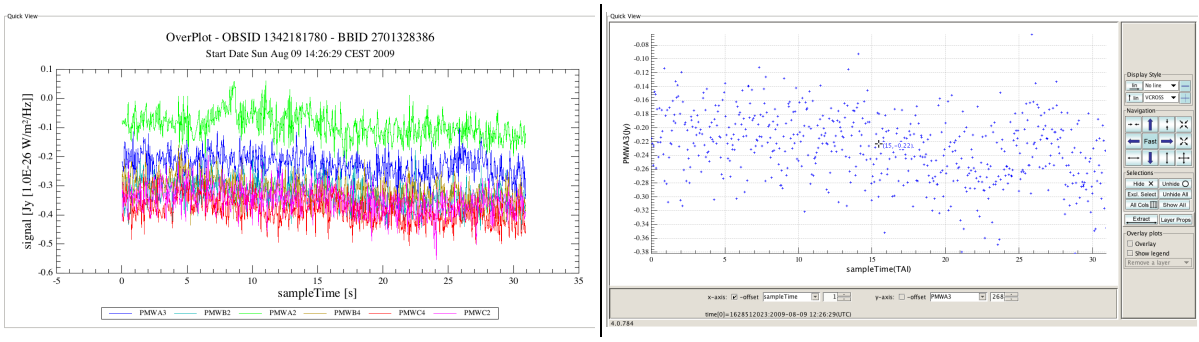

Figure 8. Plot Visualization: Over Plot (Left) and Table Plotter (Right).

1.2.4. Overplot

To enable overplotting we need check the "Over Plot" radiobutton within Control Panel area (Section 1.2.3). Overplotting is allowed only within "Quick View" area. When floating plot window is selected and we check "Over Plot" checkbox, a info-window shows this message:"Overplotting not allowed in floating windows" and the last plot is redraw within "Quick View" area and here we can start the overplotting. For this reason, when we check "Over Plot" radiobutton, the "Select Plot Windows" radiobuttons are disabled.

During overplotting is not possible change "X axis" scale.

1.2.5. Table Plotter

To visualize the data with Table Plotter we need check the "Table Plotter" radiobutton within Control Panel area (Section 1.2.3).

When TablePlotter radiobutton is selected, we can click on the desired detector inside Array Display area to visualize it.

We can create a Table Plotter object both in "Quick View" area and in floating window.

1.2.6. Color&Mask Preferences

The Color&Mask Preferences panel allow us to:

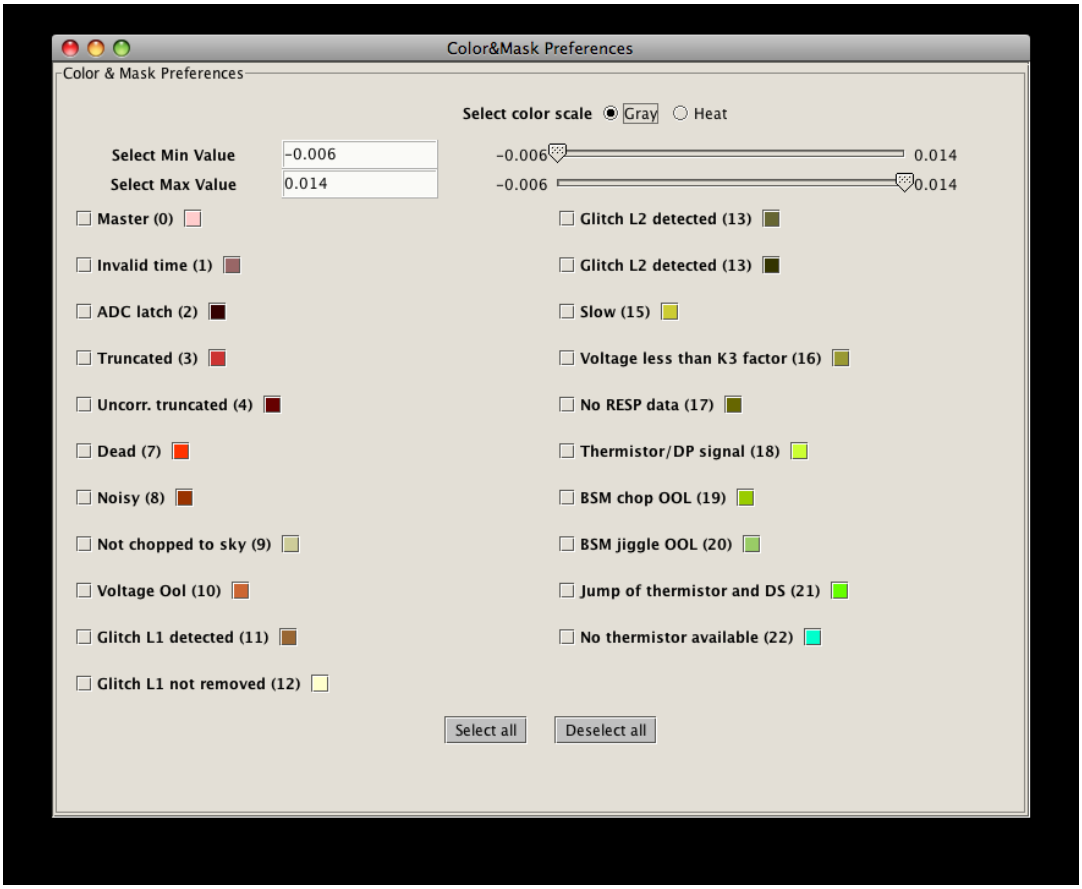

Figure 9. Color&Mask Preferences panel.

1. Select the scale color for the bolometer's array visualization: heat or gray scheme are available (see Section 1.2.6.1);
2. Select the Max/Min value for the color scale (see Section 1.2.6.1);
3. Work with the mask (see Section 1.2.6.2).

1.2.6.1. Color Preferences

Using "Select color scale" radiobuttons it's possible to choise the color scheme between gray (default) and heat.

To select min/max value for the color scale we can use or the writable fields or the sliders. When we change the min value, all the bolometers with a registered value below this limit are colored white. When we change the max value, all the bolometers with a registered value over this limit are colored black. The new colors for the others bolometers are calculated using this new limits (Figure 10).

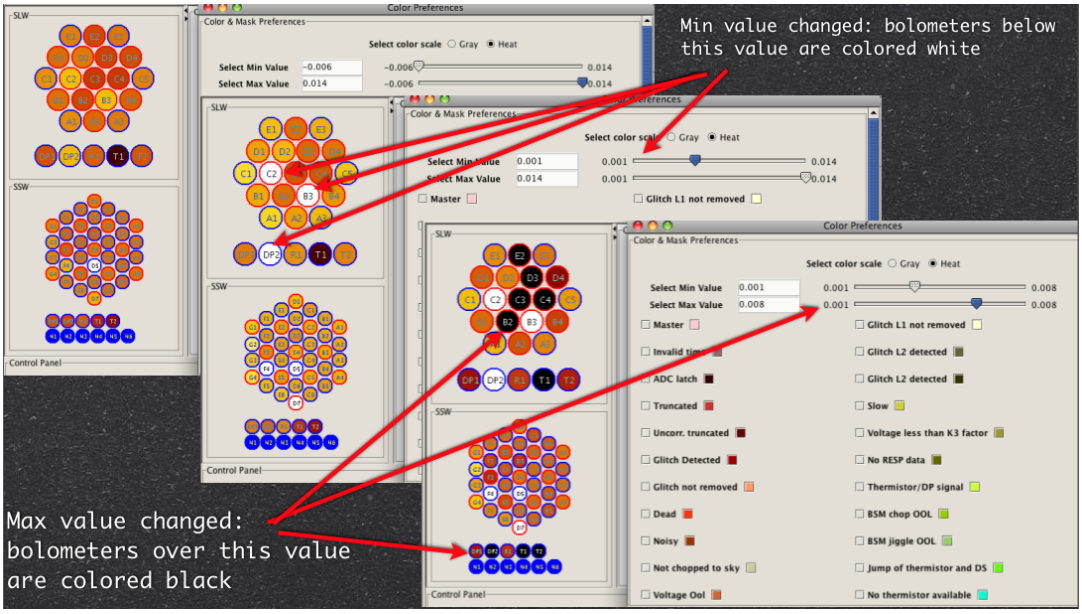
Min value changed: bolometers below this value are colored white
Max value changed: bolometers over this value are colored black

Figure 10. Color scale Min/Max value example.

1.2.6.2. Mask Preferences

It's possible that some detectors in the dataset are flagged because they have an error or a problem. This information is contained in the "Mask" dataset and with DTE we can use this information to optimize the visualization of the data. The mask preferences show a list of mask values as defined by SpireMask (see Figure 9) and for each of this values we have a checkbox and a colored button. Via checkbox it's possible to select a specific mask value and via colored button it's possible assign a color to the specific mask value.

The selection of a specific mask value cause the update of:

- **the display array:** the bolometers flagged (at the selected readout #) by this mask are colored with the associated color (Figure 11). It's possible use the slider (Figure 7) for browsing trough time across the timeline.
- **the displayed plot:** the mask is overplotted to the current plotted data (Figure 12).

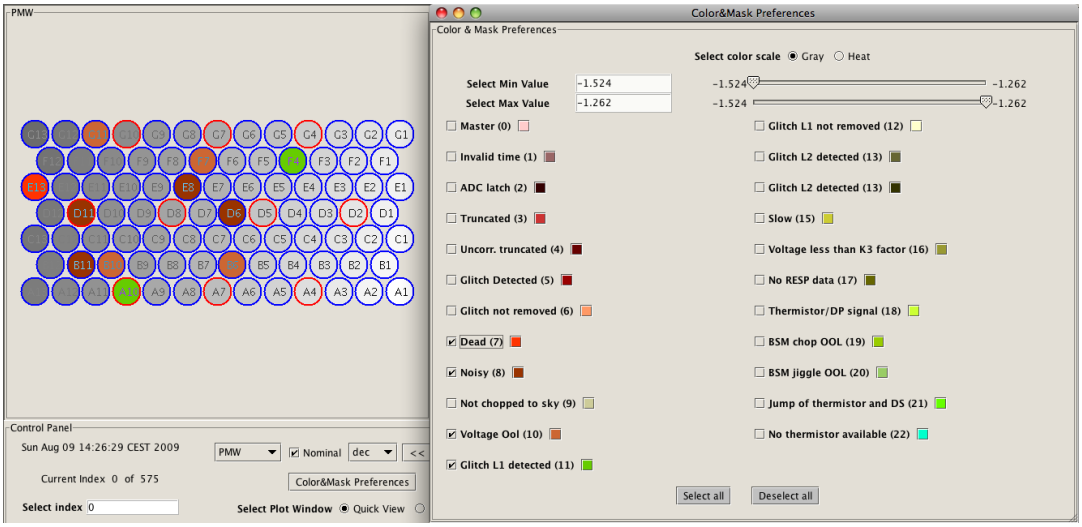

Figure 11. Mask preferences: the selection of a specific mask value cause the update of the Array Display.

The "mask oveplot" style is linked to the mask preferences: if we change the color associated at the mask, we change also the layer color. Different mask value have also different plot symbol.

The Y axis on the right shows the bit number of the mask.

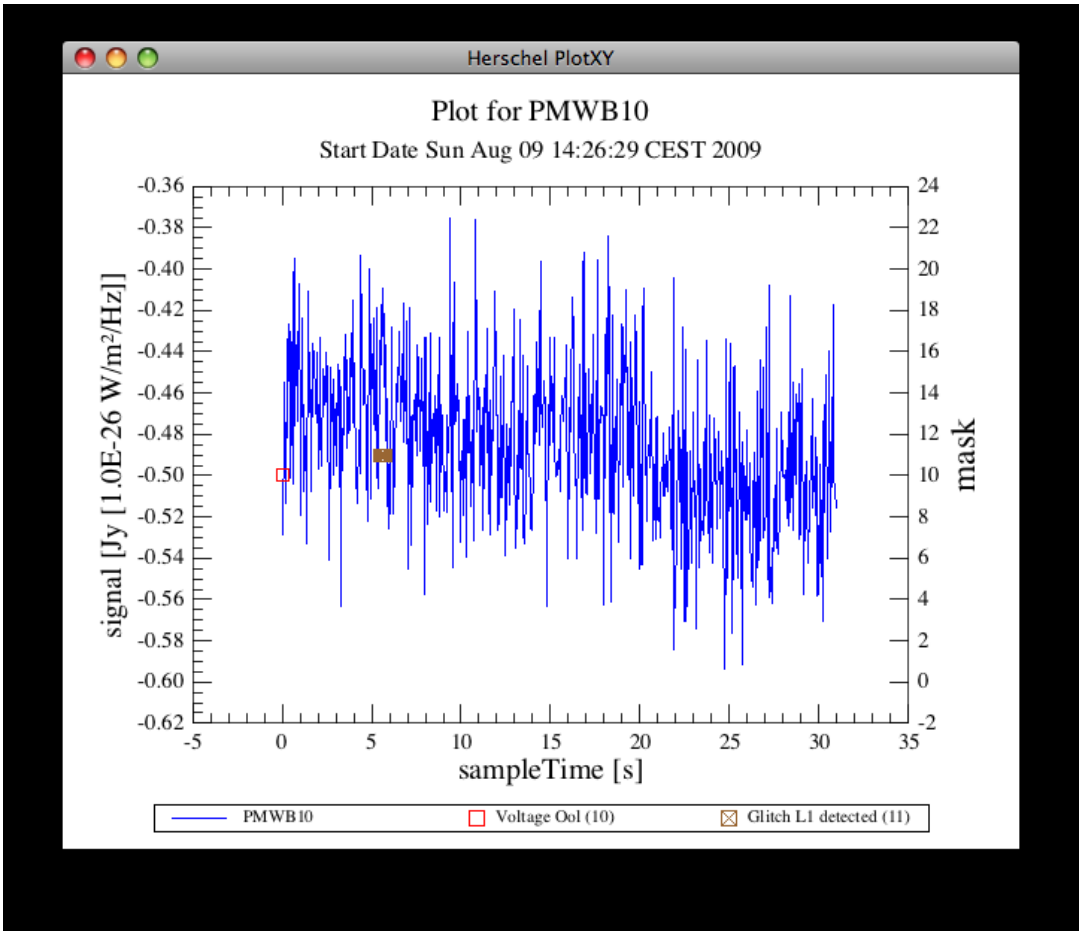

Figure 12. Mask preferences: the mask value is overplotted to the data.

1.3. Examples 1: Plotting functions

In order to inspect detectors from a specific product using the DetectorTimelineExplorer plotting functions perform the following steps:

1. Start the DTE for the product in question.
2. Click on the desired detector to create the plot.
3. Click on another detector to change the displayed plot.
4. Select "Over Plot" radio button within "Control Panel" to allow the overplotting (see Figure 13).
5. Click on another detector to overplot the data (see Figure 8).

6. To see the last plotted data within TablePlotter (Figure 8) select "Table Plotter" radio button within "Control Panel" (see Figure 13).

7. To change the detector displayed with Table Plotter, simply click on the desired detector in the Array Display.

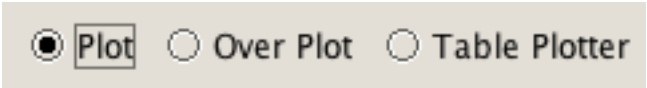

Figure 13. Radio buttons to select the plotting options.

1.4. Examples 2: Browse trough time across the timeline.

In order to browse trough time across the timeline perform the following steps:

1. Start the DTE for the product in question.

2. In the Control Panel click on the ">>" button to go on the next step of the timeline readout. (Figure 7)

3. To automatize the browsing, click on the "PLAY" button. (Figure 7)

4. Use "PAUSE" button to block the automatic browsing and "STOP" button to come back at the beginning of the timelines. (Figure 7)

5. To change the speed of the automatic browsing change the value in the "FPS" (frame per second) textfield (default value = 30 fps, Figure 7).

1.5. Examples 3: Visualize the flagged detectors in Array Display

In order to Visualize the flagged detectors perform the following steps:

1. Start the DTE for the product in question.

2. In the Control Panel click on the "Color&Mask Preferences" button to open the preferences panel (Figure 5).

3. Select the mask value you are interested using the checkboxs: if a detetctor is flagged by this mask (at the selected timeline readout #) its color in Array Display change according with associated color (Figure 14). You can select all the mask value simply clicking on the "Select all" button (and deselect all the mask value clicking on the "Deselect all" button, Figure 9).

4. You can change the color associated at the mask clicking on the colored button and selecting the new color from color selector (Figure 15).

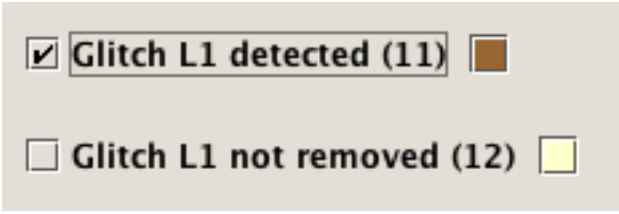

Figure 14. Mask preferences: two mask values with associated checkboxs and color buttons.

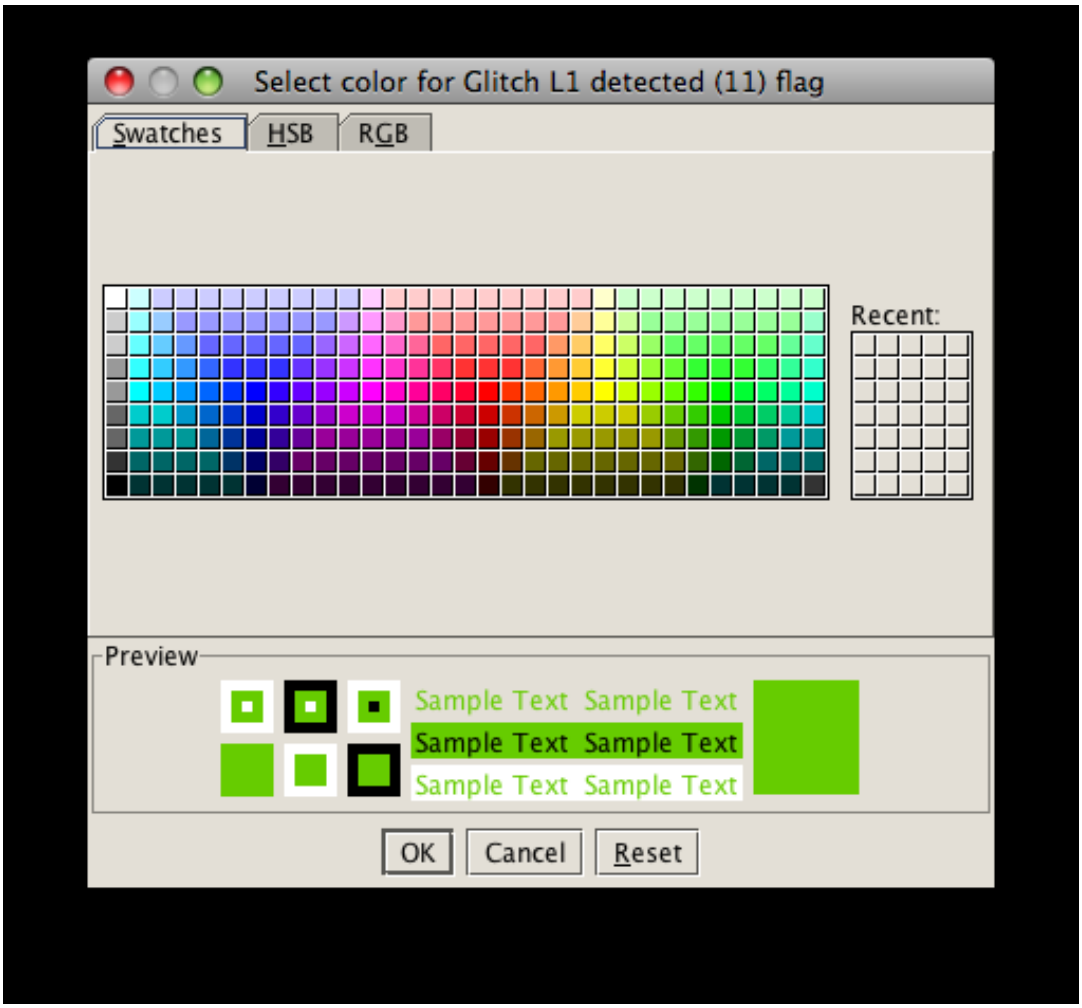

Figure 15. Mask preferences: color selector to change the color associated at the mask value.